Problem 7 Walkthrough

NFAs, Stage 2

Create an NFA for the language “all base 3 numbers without leading zeros that are divisible by 3”

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What our NFA **should** accept:
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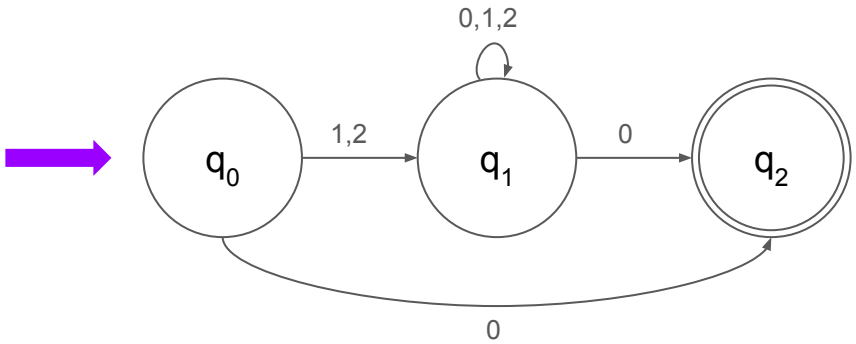

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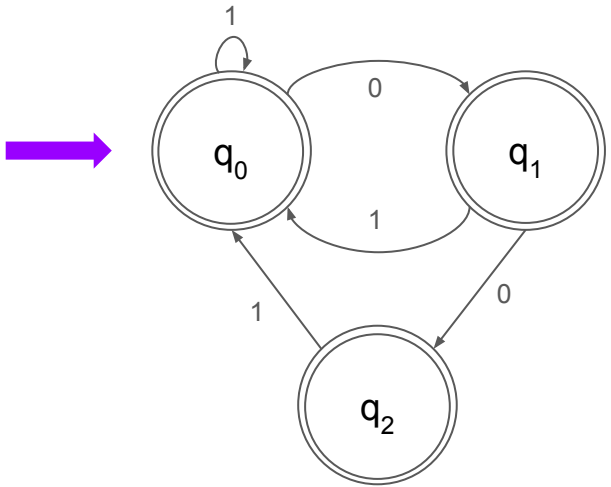

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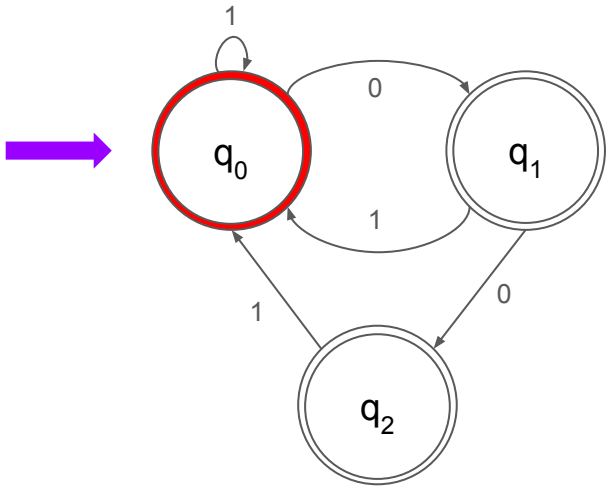

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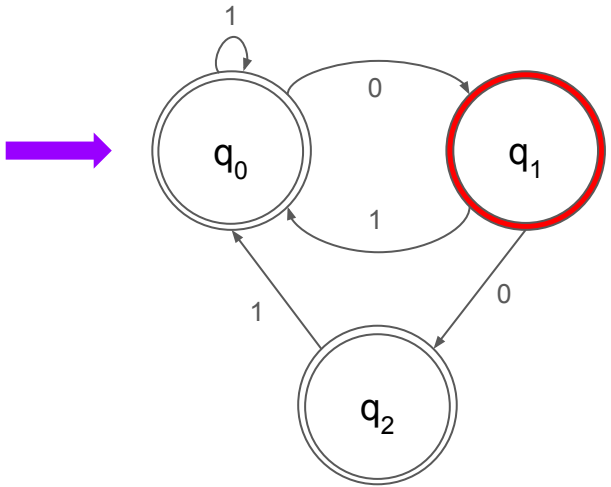

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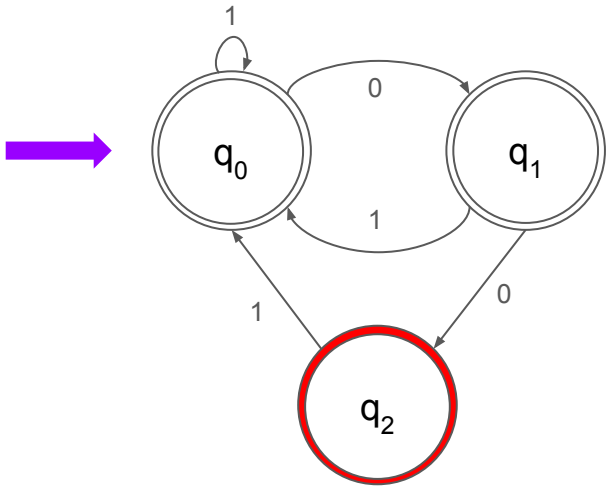

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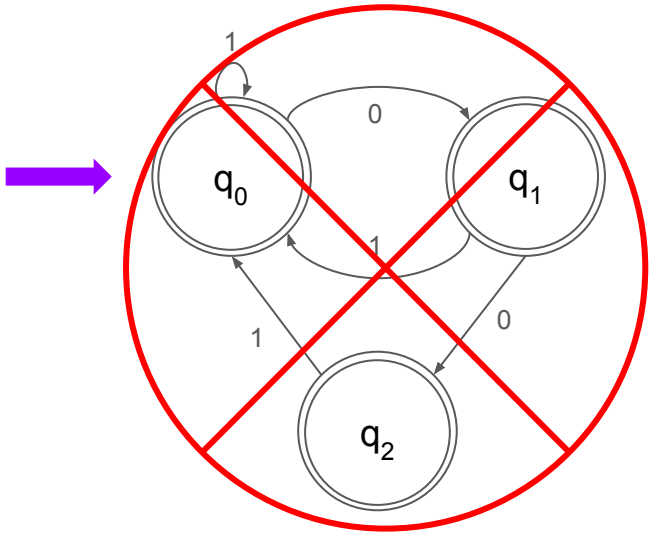

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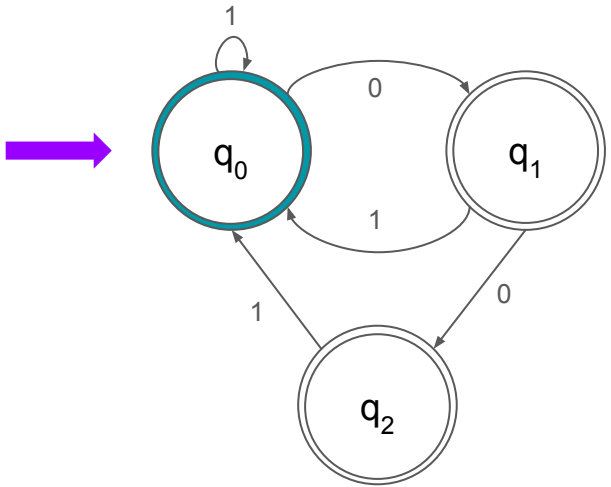

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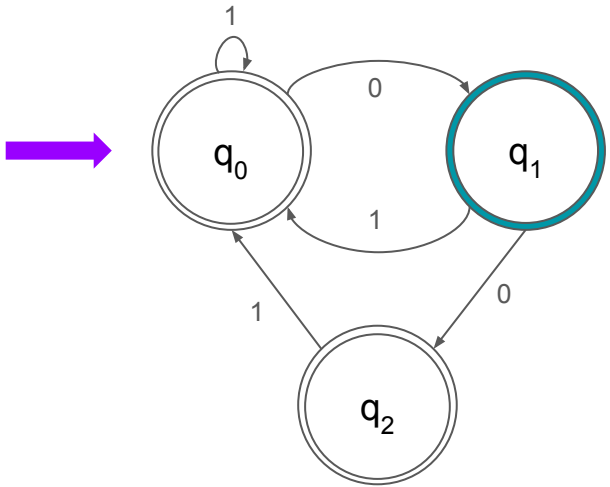

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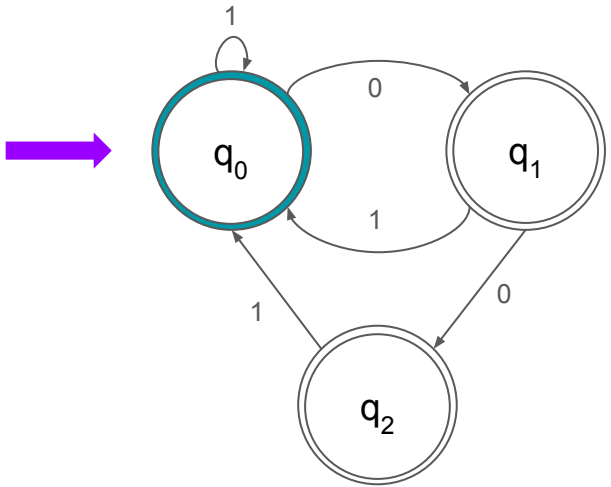

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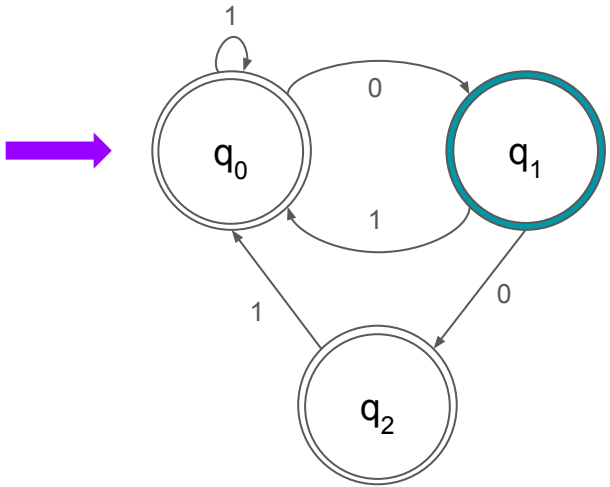

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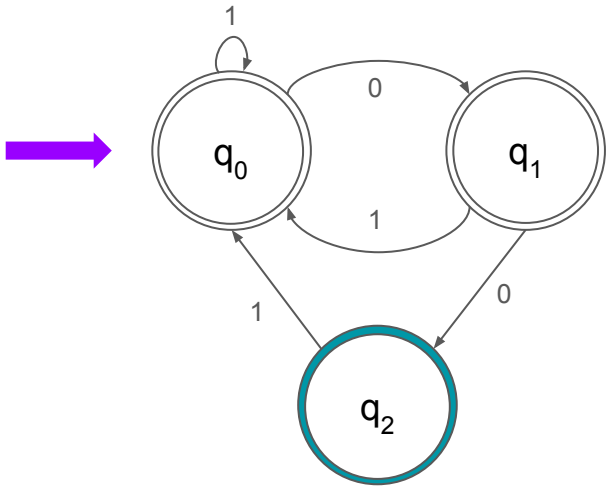

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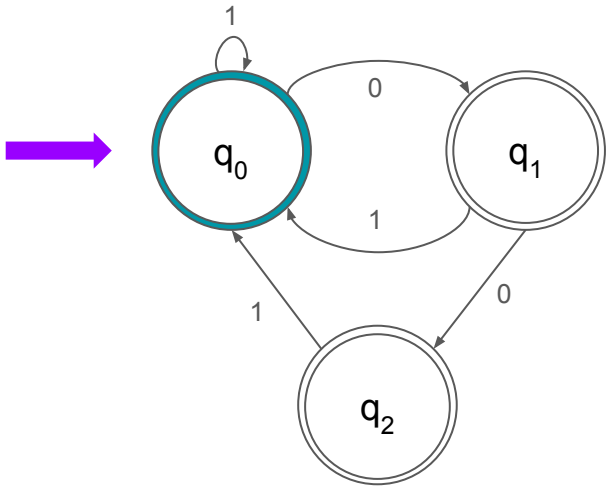

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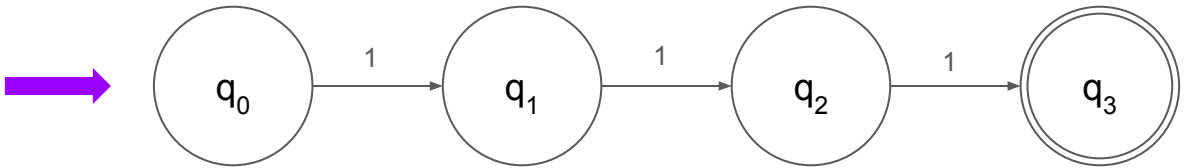

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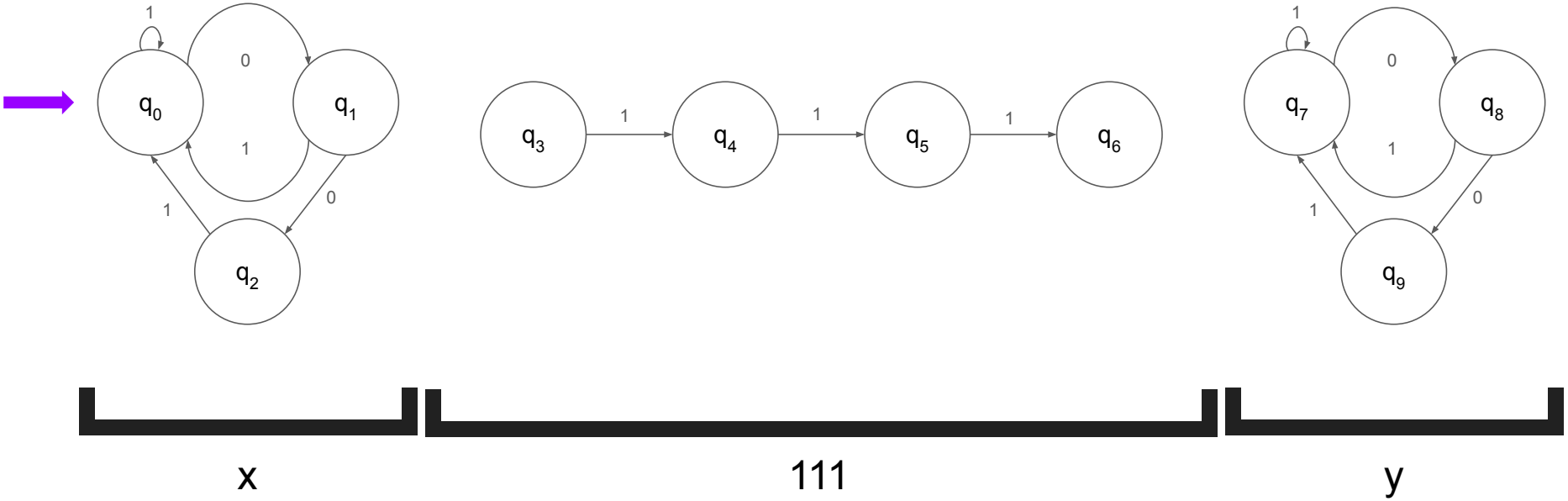
Let’s start combining the NFAs!



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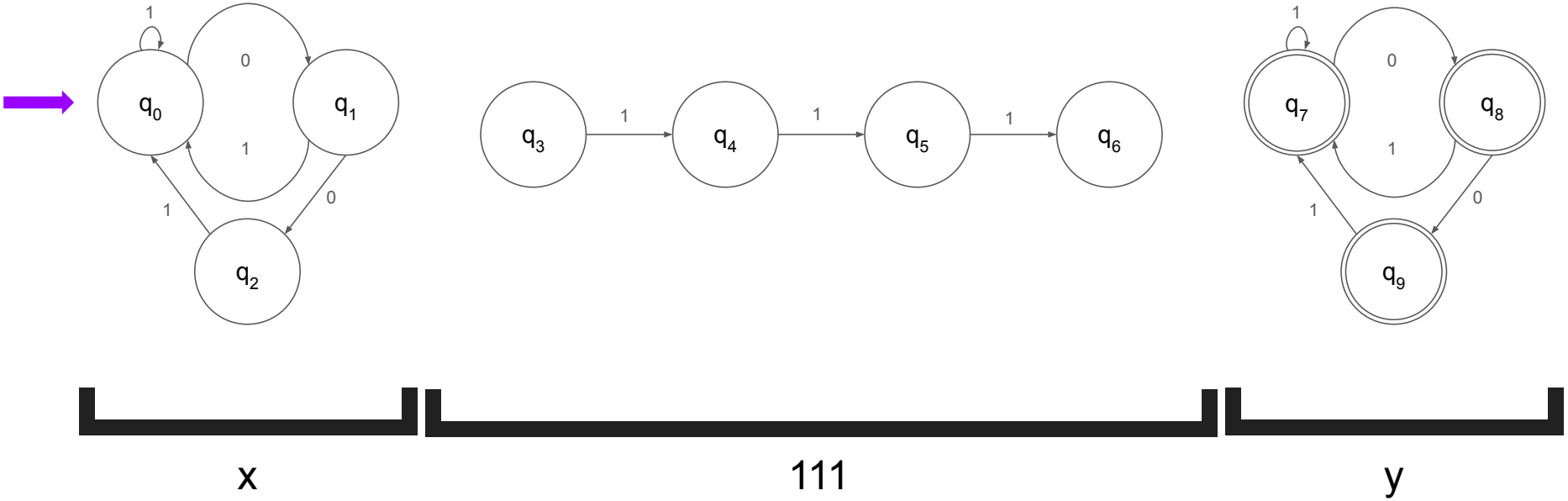

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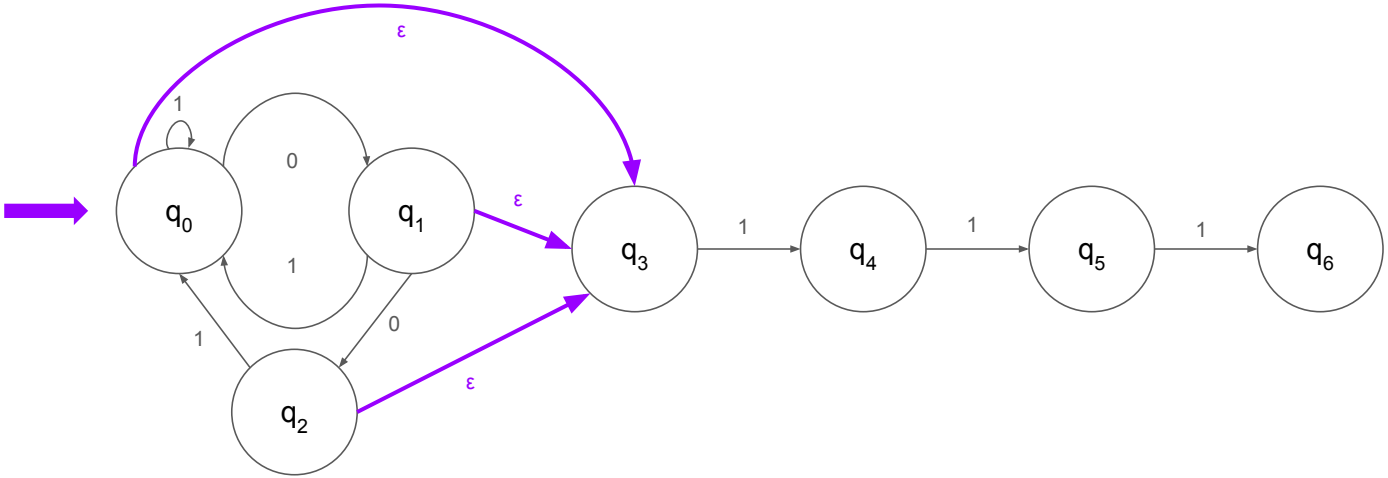

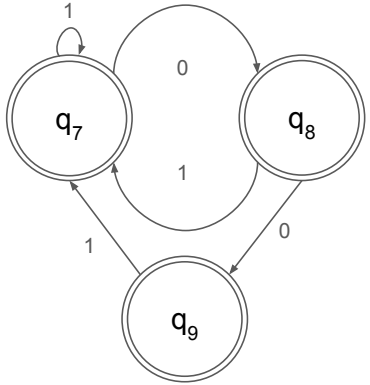

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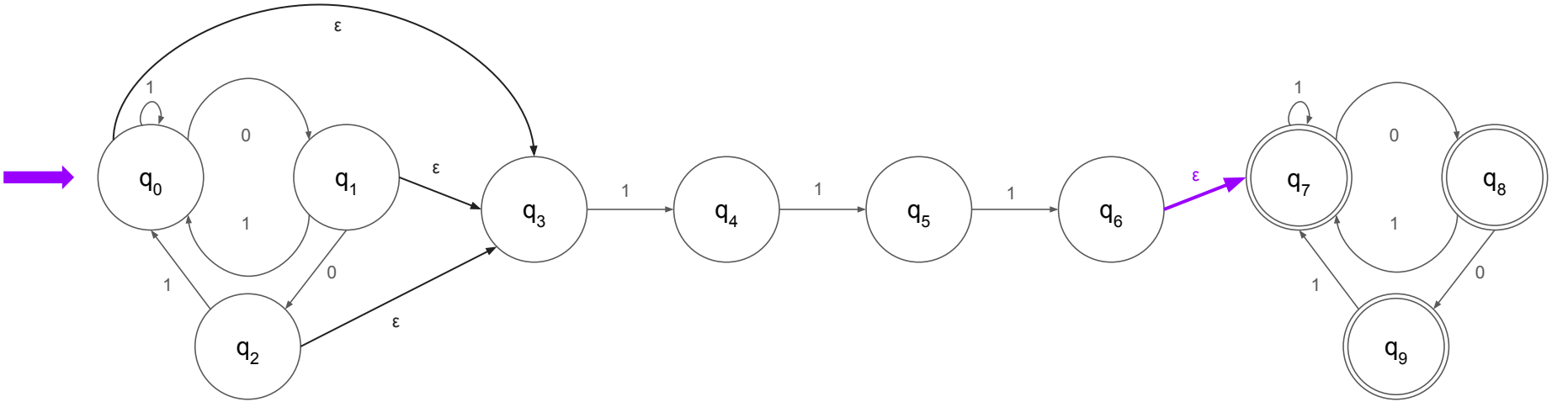

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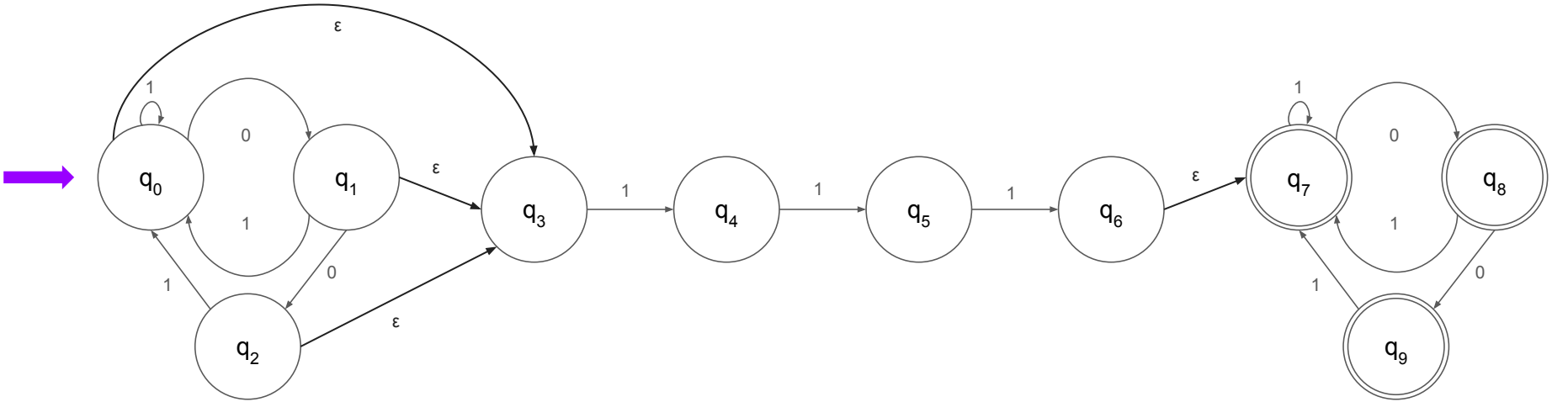

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States: one representing the last seen character being a zero and another state representing the last seen character being a one.

Transitions: The only way to transition out of a state is by consuming the other character. As long as the entire string can be consumed, then both states should be accepting.

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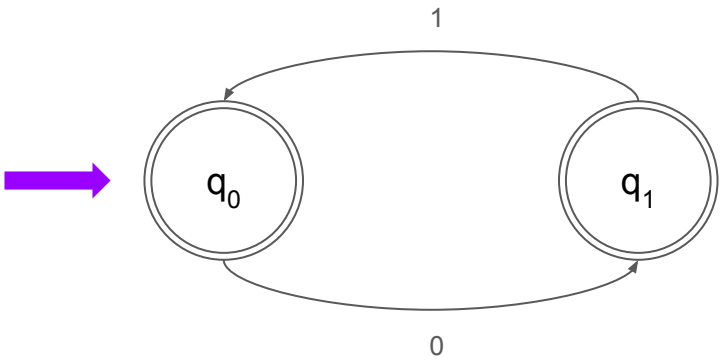

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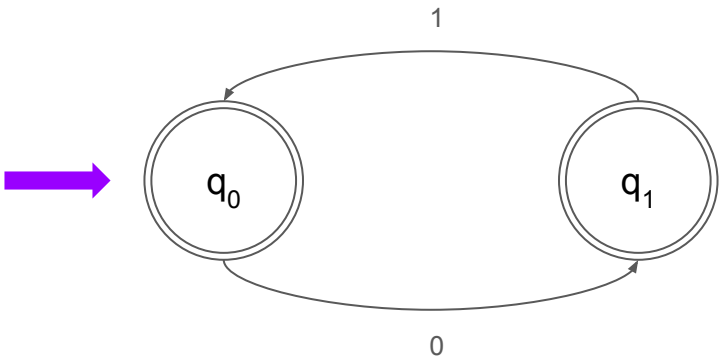

What if the string starts with a “1”?

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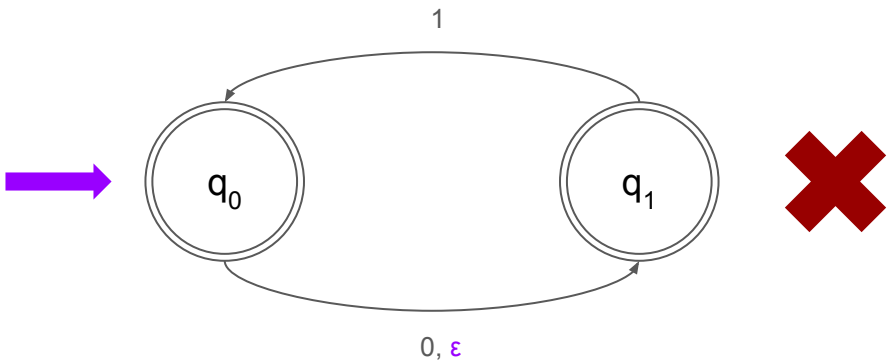

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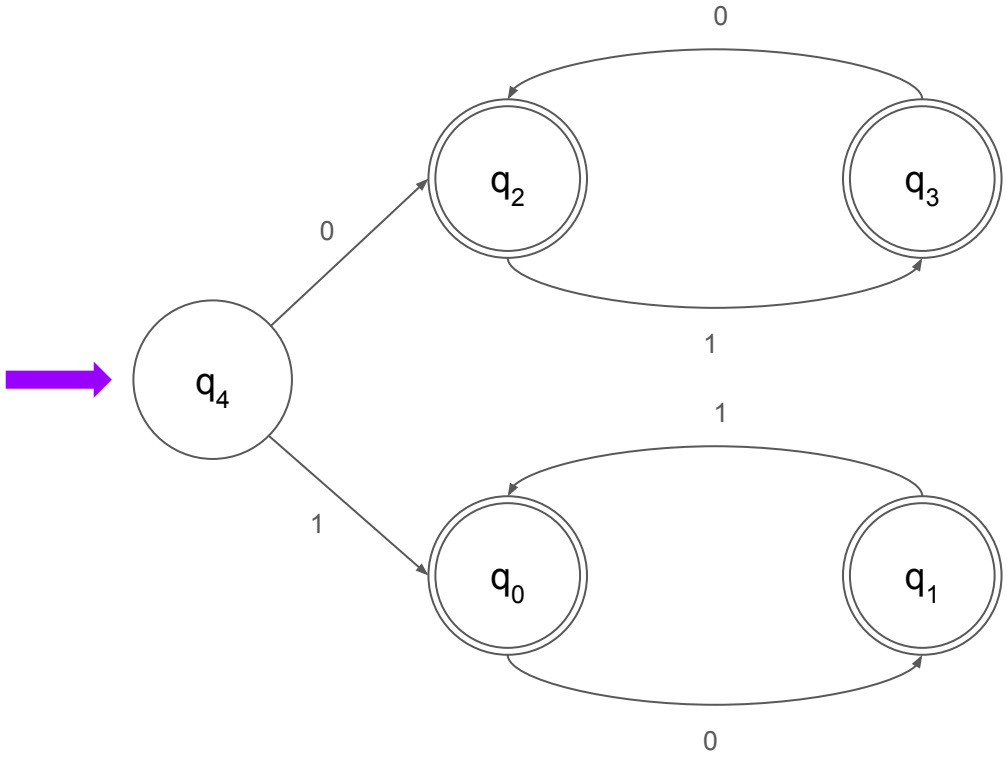

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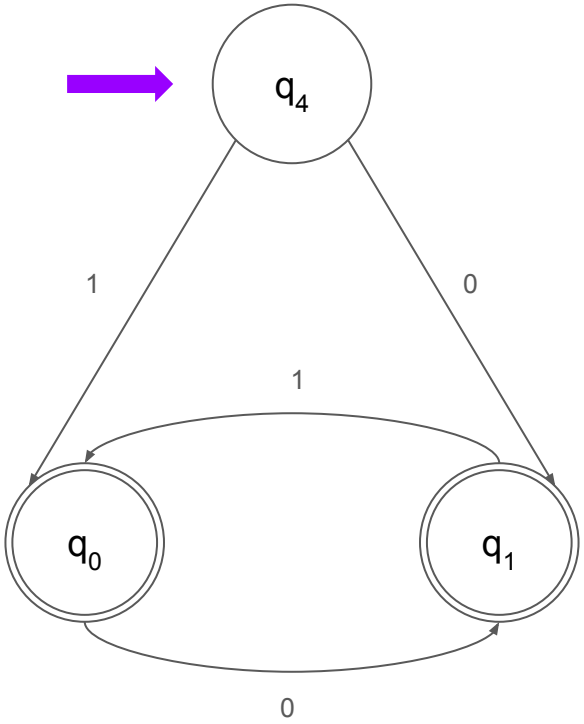

Strategies / Intuition for building NFAs

- Observe some property about the language and “force” that property in our NFA.
  - In our first problem with base 3, we observed that all accepted strings must end in zero. We force that property in our NFA by ensuring that zero is the last character consumed.
- Build NFAs for substrings and combine.
  - In our second problem, we decomposed our language into x111y and built NFAs for x, y, and 111 before recombining them for our original language.
  - **Be careful when combining!**
- Enumerate states and transitions
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